SO-1027
IM-1007
OA-1037
SECTION

PROGRAMMED TEST SOURCES, inc.
Littleton, Massachusetts, USA.

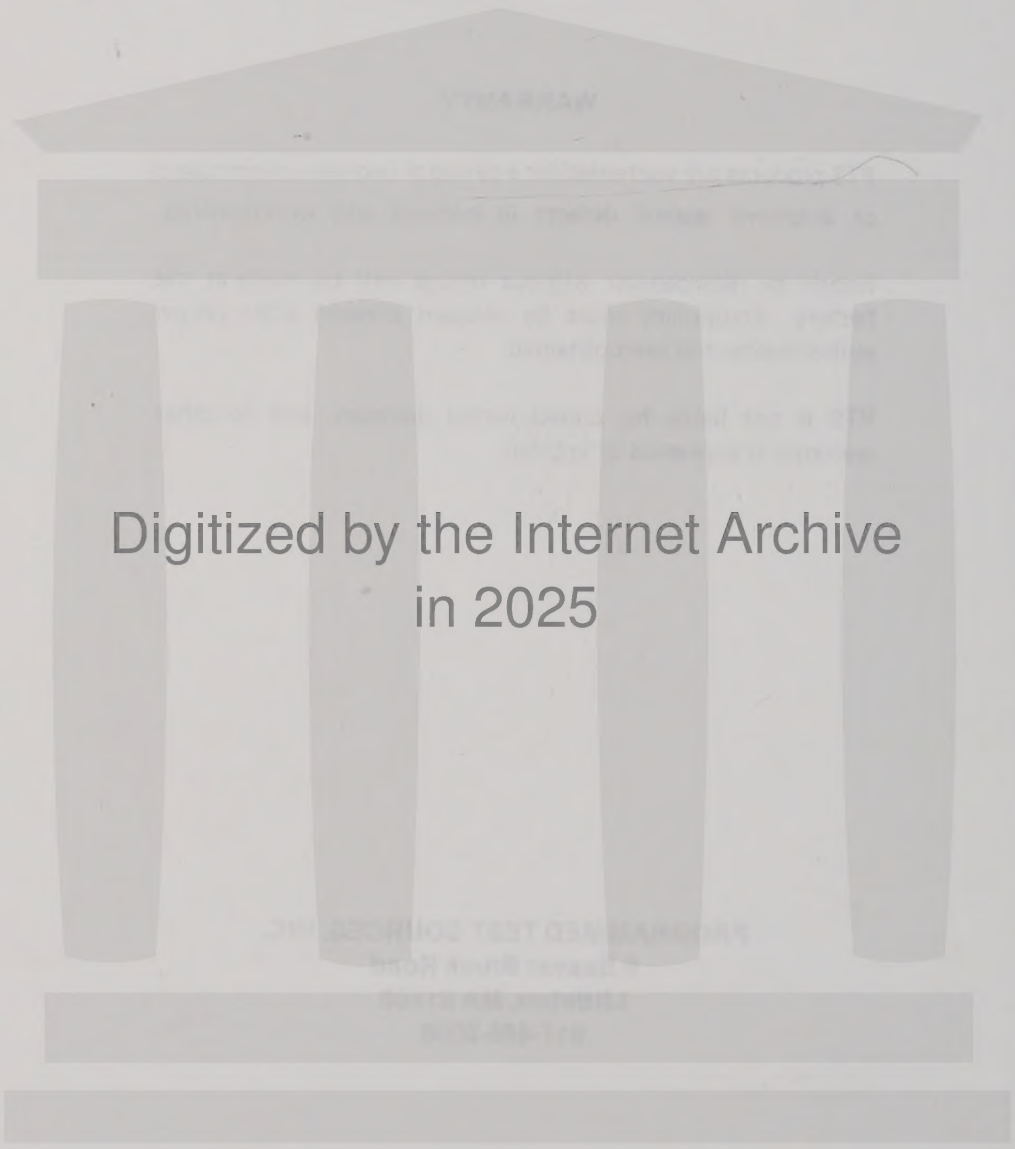
WARRANTY

PTS products are warranted for a period of two years from date of of shipment against defects in material and workmanship.

Repair or replacement without charge will be made at the factory. Equipment must be shipped prepaid after return authorization has been obtained.

PTS is not liable for consequential damages, and no other warranty is expressed or implied.

PROGRAMMED TEST SOURCES, INC.
9 Beaver Brook Road
Littleton, MA 01460
617-486-3008



Digitized by the Internet Archive
in 2025

https://archive.org/details/manualsplus_11233

TABLE OF CONTENTS

Introduction 1
Principles of Operation 2
10 MHz Step Function 2
Output Amplification and Level Control 4
Service 5
Maintenance 5
Alignment/Calibration 5
Troubleshooting 6
Module Checks 7
Parts Lists 10
Figure 1 (Block Diagram) 20
Figure 2 (Schematic SO-1027) 21
Figure 3 (Schematic IM-1007) 22
Figure 4 (Schematic OA-1037) 23
Figure 5 (PC Assembly SO-1027) 24
Figure 6 (PC Assembly IM-1007) 25
Figure 7 (PC Assembly OA-1037) 26

Copyright © 1985 by Programmed Test Sources, Inc., Littleton, Massachusetts.

INTRODUCTION

The 10 MHz Step Section consists of three separate modules, the SO-1027, the IM-1007 and the OA-1037. They work in conjunction with the 505 MHz band-pass filter (390-1000) as the final functional block of the synthesizer. This block performs frequency translations to obtain the selected 10 MHz decade within the 250 MHz range and also provides the desired output level over a 10 dB range up to +13 dBm.

The heart of the 10 MHz Step Section is the SO-1027, switched oscillator, whose digitally controlled frequency spans a 240 MHz range in 10 MHz increments. Together with the intermediate mixer module, IM-1007, it performs a drift-cancelling double-conversion process, which negates any frequency fluctuations of this oscillator but adds or subtracts the appropriate 10 MHz harmonic from the basic reference source picket-fence to the signal supplied by the DMA module (140-150 MHz). The end result is simply expressed by: Output Frequency = DMA Frequency + (n × 10 MHz) with n = − 14 through 0 to + 10 depending on the selected 10 MHz multiple. The output amplifier, OA-1020 brings this signal to a level of 20 mW. Level control is accomplished through a feedback loop involving a "PIN"-diode modulator in the IM module as the variable gain element. The controlling signal is derived from a level-sensing detector and comparator in the OA module.

The modules of this section are unique, not interchangeable with each other or other modules in the synthesizer. All three modules employ coax connectors which must be released before removal from the deck is possible. In addition, the IM and SO modules use push-on connectors for various supply and programming inputs. The OA module uses a 10-pin card-edge connector. The modules are secured from the bottom of the deck by 6-32 pan-head screws; the SO uses three, the OA and IM two each. The PC boards of these modules are not accessible without removal of the module from the deck and subsequent removal of the covers. The 505 MHz filter is permanently mounted to the deck structure.

PRINCIPLES OF OPERATION

The two main functions of the 10 MHz step section are:

1. Generation of the final 10 MHz step in the synthesis process.
2. Output amplification and level control.

A detailed description of how these functions are implemented follows. Use block diagram PTS 250 (Figure 1), schematic SO-1027 (Figure 2), schematic IM-1007 (Figure 3) and schematic OA-1037 (Figure 4) for reference.

The 10 MHz Step Function

In order to obtain the desired output frequency, a 10 MHz multiple must be added or subtracted from the 140-150 MHz signal provided by the DMA module. This is done in a drift cancelled loop involving the SO and the IM modules and a narrow bandpass filter centered at 505 MHz. A major element in this scheme is the switched oscillator in the SO module, which can be set to one of 25 frequencies spaced 10 MHz by a 6-bit control word.

The program input in BCD code and TTL level is first transposed by transistors Q10-Q15 by approximately – 12 V. The 1-of-25 decoder (U1, U5) operates from –6.8V to –11.4V; the latter is a stabilized and filtered voltage, produced by regulator CR8, Q1/Q2, Q3. Stabilization and low ripple are needed since this voltage is eventually applied to the oscillator varactors. The output of the decoder, by connecting one of the divider-resistors R1-R20 to –11.4V, produces proper voltages to set oscillator Q7 to frequencies from 365-605 in 10 MHz steps.

The oscillator frequency is changed by means of varactor diodes CR11, CR12. Control voltage ranges from 4.0V (365 MHz) to –11.0V (605 MHz), approximately. Q6, driven by another output of the decoder provides a range switch function through CR13 between digits "13" and "14".

The oscillator output is fed to two separate broad band amplifiers for gain and isolation; at both mixers M1 and M2 this signal is used as the switching (LO) signal with a level of +10 to +16 dBm. M1 is connected through an attentuator in the deck and a low-pass filter (L2, L3 and capacitors) to the picket fence signal (n x 10 MHz, 10-140 MHz). At each setting of the VCO one of the sum or difference frequencies equals 505 MHz. This signal is filtered by the bandpass filter connected to J2. The output of the filter feeds the IM module.

Mixer M2 produces the instrument output signal, which is amplified in the OA module. The low level input to M2 at J4 (365-355 MHz), which carries all digits except the 10 MHz steps, comes from the IM module. Any frequency drift of the VCO affects the two inputs to M2 in the same direction and by the same amount which cancels completely in the final output (1 to 250 MHz), which is the difference between the two mixer inputs.

The IM-1007 module contains the other elements of the drift cancelled loop. It consists of a 505 MHz broadly tuned amplifier, a mixer, a pin-diode attenuator and a 3-pole bandpass filter for 365-355 MHz.

The unit receives a 505 MHz signal from the SO module via the 505 MHz bandpass filter located in the deck. Five-stage amplifier Q1-5 increases this signal to drive mixer M1 at approximately +15 dBm.

The low-level signal to M1 is the 140-150 MHz input which comes from the DMA through a matching pad. Mixer M1 produces 365-355 MHz, the difference between 505 MHz and 140-150 MHz. It is fed to the pin-modulator CR1-CR4, which is driven from the OA and is a part of the output levelling loop. Minimum attenuation is obtained with a -11.5V input. The signal is then filtered in the 3-pole filter (L1, L2, L3) and fed back to the SO via J3, thereby closing the drift cancelling loop.

Output Amplification and Level Control

The final output (1-250 MHz) from M2 in the SO module is a low-level signal of nominally – 32 dBm. The output amplifier OA module provides the necessary wideband gain and levelling of amplitude to produce instrument outputs up to +13 dBm across the band from a 50 ohm source-impedance with substantially flat response. See schematic 1027-S (Figure 4).

The RF gain portion from input J2 to output J1 provides insertion gain in a 50-ohm system of approximately 45 dB from 1 MHz to 200 MHz. The gain is produced by four bi-polar transistors in C/E configuration. The amplifiers use emitter degeneration at low frequencies to obtain a flat response. Two stages of pre-amplification are followed by a driver and an output stage. The module input, which is connected to the final mixer output in the SO module, contains a low-pass filter to reduce levels of signals above 260 MHz.

To operate the levelling loop, the RF output signal is detected by CR1/CR2. The resulting DC voltage, after suitable amplification, is compared to the "set-level" voltage in the op-amp U1. The output of this amplifier (1) regulates the current of the PIN-diode attenuator in the IM module, which controls the amplifier input signal such that only a minute error-voltage exists between the amplified "set-level" voltage (U1,7) and the amplified detector voltage U1,8. This means that the RF voltage at the detector is stabilized at a constant set level. The actual output voltage into a matched load impedance (50 ohms) is one-half of the detector voltage with R27 providing the 50 ohm source impedance. The unterminated output can reach a level of twice the voltage shown by the meter on the front panel.

SERVICE

Maintenance

No preventive maintenance is required for the three modules of this section. The presence of output signals of correct frequency and level indicates that the modules are operating properly. Minor aging effects will not impair performance. Detailed verification of systems and module operation is made with the system troubleshooting table in the system section.

Alignment/Calibration

Modules are tested and calibrated at the factory in special test fixtures. Complete alignment of the SO and IM modules is beyond the scope of this manual; most active and passive components of these modules, however, can be replaced if they become defective, without any recalibration. The only calibration in the OA module is the adjustment of the meter circuit, described below.

OA Module, Meter Calibration

Remove module from deck after carefully releasing coax connectors and 6-32 screws. Remove cover, reinstall module without cover, connect power or level meter (50 ohm terminated) directly to the output jack, i.e., the level sensing head should see no additional attenuation. Set frequency to 100 MHz and adjust level control to obtain +13 dBm reading on front panel meter. If necessary, readjust **R39** to obtain +13 dBm on power or level meter. Reset level to +3 dBm on panel meter. Adjust **R36** if needed to match reading on power meter. Repeat sequence several times to eliminate effects of interaction. Reinstall cover and recheck.

Troubleshooting

The system section of this manual has the necessary information to isolate a faulty module in the 10 MHz Step Section. It is important to follow the procedure in detail to ensure proper identification of the faulty module. Further tests here require the same test equipment as detailed under System Troubleshooting.

Aspects of the generation of the proper frequency are all covered in the system troubleshooting chart. This leaves the checks concerning the levelling loop. Meter recalibration in the OA module is detailed above.

A normally functioning instrument will produce a PIN-modulator voltage (OA pin 20) of −4 to −11.0V at an output setting of +13 dBm into a 50 ohm load. This voltage (PIN-voltage) is an easily accessible monitor for loop problems. It permits diagnosis of most troubles. If it saturates to −11.5V, insufficient gain is available to produce the output demanded.

The first step in the system troubleshooting chart that involves the PIN-voltage is No. 15. To obtain -16 dBm output from the IM requires a PIN-voltage of 11.5V; since the loop is open (SA connected to IM output), the OA will produce this voltage unless it is faulty. The OA, however, must see +2.0V at its pin 22. This voltage comes from the front panel level pot. A built-in voltage divider or an external feed through programming connector pin 22 supplies this voltage in instruments without front panel controls. If no positive voltage is available on OA pin 22, check these sources.

An *apparent* lack of output can obviously result from a failure of the meter or the meter resistor R18 in the OA. If the spectrum analyzer or level meter record output, but no meter indication is obtained, a check of the 1 mA, 100 ohm, front panel meter or the resistor is in order. The PIN-voltage will not indicate post-detector faults in the system. If the voltage is normal, but no output is available, check output coax cable, connectors and R27,C34 in the OA module.

Module Checks

After one of the three modules has been found suspect or defective, it is recommended to return the module to the factory for repair. In emergency situations a number of checks are detailed below, which may enable a skilled technician to locate the specific fault.

Most failures of active devices result in drastic changes of the DC voltages of the semiconductor. For this reason DC checks are always the proper first step. Further, a careful examination of the PC board may reveal overheated components, bad solder joints, broken track, etc.

Replacement of faulty components requires careful use of printed-circuit repair techniques as applicable to double-sided boards with plated-through holes.

OA Module Tests

Carefully remove module after releasing 6-32 screws and coax connectors below the deck. Remove cover from module. To perform DC tests, the module has to be powered, preferably through a 10-pin, card-edge connector (0.156 spacing) with: -12.4V at pin 28, current 100mA; +5.4V at pin 26, current 40 mA. Ground return is pin 19.

Transistor currents in the RF part of the OA are best checked by measuring the drop across the emitter resistors.

Q	Res	Voltage
1	R3	75mV
2	R9	55mV
3	R16 + 17	4.2V
4	R24 + 25	3.7V

Deviations of over 20% are not normal. Replacement of any of the above transistors will not require recalibration. Part or transistor replacement in the detector-op-amp part of the OA calls for recalibration of the meter circuit; see page 5.

SO Module Tests

Check – 12.4V current with ammeter (in blue lead). Normal values are 195mA for digit 10 MHz; and 220 mA for digit 240 MHz. Any significant deviation confirms some component or wiring fault, which might be detectable by careful inspection of the open module.

Unplug bottom connections, coax and feed-through clips, remove module and remove cover. Do not change any pot settings. Power module with -12.4V through C44 and check:

1. – 11.4V regulator voltage at Q3 case. Non-compliance indicates trouble in regulator section around Q1-Q2.

2. Verify mixer input levels at L4, TAP for M1 and L11, TAP for M2 to be + 16 dBm and + 13 dBm respectively. (Use RF voltmeter.) If both are off, oscillator section is suspect. If only one is off, associated amplifier section is suspect, Q4-Q5 or Q8-Q9. Emitter resistor voltage drops across R21, R27, R55, R60 are 1.7 – 2.3V.

Generally no recalibration is required after replacement of transistors and components in the amplifier and regulator sections.

IM Module Tests

Check -12.4V current with ammeter (in blue lead). Normal value is 65 mA. Reconnect blue lead, remove orange lead and apply -12.4V through ammeter to this capacitor, normal current is 10 mA. Any significant deviation confirms a major component or wiring fault. Release coax connector and remove module after releasing the 6-32 screws; remove cover. If inspection does not provide any clues, power module with -12.4V through C41 and measure voltage drops in the emitter resistors:

Q	Res.	Voltage
1	R33	1.3V
2	R27	1.3V
3	R22	1.3V
4	R16	1.3V
5	R13	1.5V

Replacements of transistors or components in the amplifier section Q1-Q5 can be done without recalibration.

SO-1027 PARTS LIST

Schem. Desig.	Description	PTS P/N
	CAPACITORS	
C1	220 pF, 10%, 500V, X5F	22-0221
C2	1 nF, 10%, 500V, X5F	22-0102
C3	10 pF, 5%, 500V, NPO	20-0100
C4	220 pF, 10%, 500V, X5F	22-0221
C5	10 pF, 5%, 500V, NPO	20-0100
C7	3.3 pF, 5%, 500V, NPO	20-1330
C8	1.5 nF, +50-20%, 500V	28-5100
C9	220 pF, 10%, 500V, X5F	22-0221
C10	15 pF, 5%, 500V, NPO	20-0150
C11	22 pF, 5%, 500V, NPO	20-0220
C12	33 pF, 5%, 500V, NPO	20-0330
C13	6.8 pF, 5%, 500V, NPO	20-1680
C14	15 pF, 5%, 500V, NPO	20-0150
C15	10 nF, 80/20%, 50V, Z5V	23-0103
C16	6.8 pF, 5%, 500V, NPO	20-1680
C17	1.0 pF, 5%, 500V, NPO	24-1100
C18	1 nF, 10%, 500V, X5F	22-0102
C19	6.8 μF, El. TANT., 35V	30-5101
C20	5 pF, 5%, 500V, NPO	20-1500
C22	10 pF, 5%, 500V, NPO	20-0100
C24	10 pF, 5%, 500V, NPO	20-0100
C25	1.5 nF, +50-20%, 500	28-5100
C26	1 nF, 10%, 500V, X5F	22-0102
C29	220 pF, 10%, 500V, X5F	22-0221
C30	10 pF, 5%, 500V, NPO	20-0100
C31	6.8 μF, El. TANT, 35V	30-5101
C32	220 pF, 10%, 500V, X5F	22-0221
C33	6.8 μF, El. TANT, 35V	30-5101
C34	10 pF, 5%, 500V, NPO	20-0100
C35	1 nF, 10%, 500V, X5F	22-0102
C36	10 nF, 80/20%, 50V, Z5V	23-0103
C37	6.8 μF, El, TANT, 35V	30-5101
C38	1.5 nF, +50-20%, 500V	28-5100
C39	1.5 nF, +50-20%, 500V	28-5100
C40	1.5 nF, +50-20%, 500V	28-5100
C41	1 nF, 10%, 500V, X5F	22-0102
C42	1 nF, 10%, 500V, X5F	22-0102
C43	10 pF, 5%, 500V, NPO	20-0100
C44	1.5 nF, +50-20%, 500V	28-5100
C45	1.5 nF, +50-20%, 500V	28-5100
C46	1.5 nF, +50-20%, 500V	28-5100
C47	220 pF, 10%, 500V, X5F	22-0221
C48	200 pF	33-5101

SO-1027 PARTS LIST

Schem. Desig.	Description	PTS P/N
	INDUCTORS	
L2	18 nH nom.	35-5115
L3	36 nH nom.	35-5110
L4	58 nH nom.	35-5105
L5	58 nH nom.	35-5105
L7	8 nH nom.	35-5112
L8	31 nH nom.	38-5100
L11	58 nH nom.	35-5105
L12	58 nH nom.	35-5105
	MIXERS	
M1	SRA-1H	65-5100
M2	MD151	65-5101
	RESISTORS	
R1	1 KΩ, 10%, 1W	17-5104
R2	1 KΩ, 10%, 1W	17-5104
R3	1 KΩ, 10%, 1W	17-5104
R4	2 KΩ, 10%, 1W	17-5100
R5	2 KΩ, 10%, 1W	17-5100
R6	2 KΩ, 10%, 1W	17-5100
R7	500 Ω, 10%, 1W	17-5103
R8	500 Ω, 10%, 1W	17-5103
R9	1 KΩ, 10%, 1W	17-5104
R10	1 KΩ, 10%, 1W	17-5104
R11	1 KΩ, 10%, 1W	17-5104
R12	1 KΩ, 10%, 1W	17-5104
R13	2 KΩ, 10%, 1W	17-5100
R14	2 KΩ, 10%, 1W	17-5100
R15	2 KΩ, 10%, 1W	17-5100
R16	2 KΩ, 10%, 1W	17-5100
R17	2 KΩ, 10%, 1W	17-5100
R18	5 KΩ, 10%, 1W	17-5102
R19	5 KΩ, 10%, 1W	17-5102
R20	5 KΩ, 10%, 1W	17-5102
R21	150 Ω, 5%, ¼W	10-0151
R23	470 Ω, 5%, ¼W	10-0471
R24	22 Ω, 5%, ¼W	10-0220
R25	4.7 KΩ, 5%, ¼W	10-0472
R26	4.7 Ω, 5%, ¼W	10-1470
R27	220 Ω, 5%, ¼W	10-0221
R28	1.5 KΩ, 5%, ¼W	10-0152
R29	4.7 KΩ, 5%, ¼W	10-0472
R30	634 Ω, 1%, ¼W	14-5108
R31	634 Ω, 1%, ¼W	14-5108
R32	243 Ω, 1%, ¼W	14-5105

SO-1027 PARTS LIST

Schem. Desig.	Description	PTS P/N
	RESISTORS (continued)	
R33	1 KΩ, 1%, ¼W	14-5103
R34	2.2 KΩ, 5%, ¼W	10-0222
R35	680 Ω, 5%, ¼W	10-0680
R36	680 Ω, 5%, ¼W	10-0681
R37	2.2 KΩ, 5%, ¼W	10-0222
R38	2.2 KΩ, 5%, ¼W	10-0222
R39	47 Ω, 5%, ¼W	10-0470
R40	10 Ω, 5%, ¼W	10-0100
R42	680 Ω, 5%, ¼W	10-0681
R43	4.7 KΩ, 5%, ¼W	10-0472
R44	6.8 Ω, 5%, ¼W	10-1680
R45	680 Ω, 5%, ¼W	10-0681
R46	22 Ω, 5%, ¼W	10-0220
R47	22 Ω, 5%, ¼W	10-0220
R48	220 Ω, 5%, ¼W	10-0221
R49	220 Ω, 5%, ¼W	10-0221
R50	4.7 KΩ, 5%, ¼W	10-0472
R51	2.2 KΩ, 5%, ¼W	10-0222
R52	47 Ω, 5%, ¼W	10-0470
R53	470 Ω, 5%, ¼W	10-0471
R54	1.5 KΩ, 5%, ¼W	10-0152
R55	220 Ω, 5%, ¼W	10-0221
R56	4.7 Ω, 5%, ¼W	10-1470
R57	22 Ω, 5%, ¼W	10-0220
R58	470 Ω, 5%, ¼W	10-0471
R59	1.5 KΩ, 5%, ¼W	10-0152
R60	100 Ω, 5%, ¼W	10-0101
R61	4.7 KΩ, 5%, ¼W	10-0472
R62	243 Ω, 1%, ¼W	14-5105
R64	15 Ω, 5%, ¼W	10-0150
R68	470 Ω, 5%, ¼W	10-0471
R69	470 Ω, 5%, ¼W	10-0471
R70	2 KΩ, 10%, 1W	17-5100
R71	100 Ω, 5%, ¼W	10-0100
R72	100 Ω, 5%, ¼W	10-0100
R73	4.7 Ω, 5%, ¼W	10-1470
R74	4.7 Ω, 5%, ¼W	10-1470
R75	4.7 Ω, 5%, ¼W	10-1470
R76	2.2 Ω, 5%, ¼W	10-1220
R77	2.2 KΩ, 5%, ¼W	10-0222
R78	2.2 KΩ, 5%, ¼W	10-0222
R79	6.8 KΩ, 5%, ¼W	10-0682
R80	6.8 KΩ, 5%, ¼W	10-0682
R81	6.8 KΩ, 5%, ¼W	10-0682
R82	4.7 Ω, 5%, ¼W	10-1470
R84	1.5 KΩ, 5%, ¼W	10-0152
R85	1 KΩ, 10%, 1W	17-5104

SO-1027 PARTS LIST

Schem. Desig.	Description	PTS P/N
	RESISTORS (continued)	
R86	1 KΩ, 10%, 1W	17-5104
R87	500 Ω, 10%, 1W	17-5103
R88	500 Ω, 10%, 1W	17-5103
R89	500 Ω, 10%, 1W	17-5103
R90	2.2 KΩ, 5%, ¼W	10-0222
R91	100 Ω, 5%, ¼W	10-0101
R92	10 KΩ, 5%, ¼W	10-0103
R93	1 KΩ, 5%, ⅛W	09-0102
R94	6.8 Ω, 5%, ¼W	10-0682
R95	100 Ω, 5%, ¼W	10-0101
R96	470 Ω, 5%, ¼W	10-0471
R97	470 Ω, 5%, ¼W	10-0471
R98	1.5 KΩ, 5%, ¼W	10-0152
R99	1.5 KΩ, 5%, ¼W	10-0152
R100	1.5 KΩ, 5%, ¼W	10-0152
R101	1.5 KΩ, 5%, ¼W	10-0152
	TRANSISTORS	
Q1	2N 3250	41-3250
Q2	2N 3250	41-3250
Q3	2N 2218	42-2218
Q4	2N 5179	40-5179
Q5	2N 5179	40-5179
Q6	2N 2369	40-2369
Q7	A400	40-A400
Q8	2N 5179	40-5179
Q9	A400	40-A400
Q10	2N 3250	41-3250
Q11	2N 3250	41-3250
Q12	2N 3250	41-3250
Q13	2N 3250	41-3250
Q14	2N 3250	41-3250
Q15	2N 3250	41-3250
	INTEGRATED CIRCUITS	
U1	74LS02	63-0002
U2	74145	60-0101
U3	74LS139	63-0139
U4	74145	60-0101
U5	74145	60-0101
	DIODES	
CR5	IN 4736A	73-4736A
CR6	IN 4151	70-4151
CR7	IN 4151	70-4151
CR8	IN 751A	73-0751
CR11	BB 141B	72-0141
CR12	BB 141B	72-0141
CR13	BA 482	71-0482

IM-1007 PARTS LIST

Schem. Desig.	Description	PTS P/N
	CAPACITORS	
C1	1-6 pF, Trimmer	26-5102
C2	1.0 pF, .25 pF, 500V, NPO	24-1100
C3	1-6 pF, Trimmer	26-5102
C4	1.0 pF, .25 pF, 500V, NPO	24-1100
C5	1-6 pF, Trimmer	26-5102
C6	220 pF, 10%, 500V, X5F	22-0221
C7	220 pF, 10%, 500V, X5F	22-0221
C8	220 pF, 10%, 500V, X5F	22-0221
C9	220 pF, 10%, 500V, X5F	22-0221
C10	10 pF, 5%, 500V, NPO	20-0100
C11	3-13 pF, Trimmer	26-5101
C12	12 pF, 5%, 500V, NPO	20-0120
C13	220 pF, 10%, 500V, X5F	22-0221
C14	10 nF, 80/20%, 50V, Z5V	23-0103
C15	220 pF, 10%, 500V, X5F	22-0221
C16	22 pF, 5%, 500V, NPO	20-0220
C17	12 pF, 5%, 500V, NPO	20-0120
C18	220 pF, 10%, 500V, X5F	22-0221
C19	220 pF, 10%, 500V, X5F	22-0221
C20	12 pF, 5%, 500V, NPO	20-0120
C21	12 pF, 5%, 500V, NPO	20-0120
C22	220 pF, 10%, 500V, X5F	22-0221
C23	220 pF, 10%, 500V, X5F	22-0221
C24	22 pF, 5%, 500V, NPO	20-0220
C25	10 pF, 5%, 500V, NPO	20-0100
C26	220 pF, 10%, 500V, X5F	22-0221
C27	10 nF, 80/20%, 50V, Z5V	23-0103
C28	220 pF, 10%, 500V, X5F	22-0221
C29	12 pF, 5%, 500V, NPO	20-0120
C30	5 pF, .25 pF, 500V, NPO	20-1500
C31	220 pF, 10%, 500V, X5F	22-0221
C32	220 pF, 10%, 500V, X5F	22-0221
C33	22 pF, 5%, 500V, NPO	20-0220
C34	10 nF, 80/20%, 50V, Z5V	23-0103
C35	220 pF, 10%, 500V, X5F	22-0221
C36	1.0 pF, .25 pF, 500V, NPO	24-1100
C37	1.5 pF, .25 pF, 500V, NPO	24-1150
C38	3.3 pF, .25 pF, 500V, NPO	20-1330
C39	2.2 pF, .25 pF, 500V, NPO	20-1220
C40	1.5 nF, +50-20%, 500V	28-5100
C41	1.5 nF, +50-20%, 500V	28-5100
C42	3-13 pF, Trimmer	26-5101
C43	5 pF, .25 pF, 500V, NPO	20-1500
C44	5 pF, .25 pF, 500V, NPO	20-1500
C45	5 pF, .25 pF, 500V, N750	21-1500
C46	5 pF, .25 pF, 500V, NPO	20-1500

IM-1007 PARTS LIST (continued)

Schem. Desig.	Description	PTS P/N
	INDUCTORS	
L1	20 nH, nom.	35-5114
L2	20 nH, nom.	35-5113
L3	20 nH, nom.	35-5113
L4	.33 μH, 10%	36-5104
L5	.33 μH, 10%	36-5104
L6	50 nH, nom.	35-5104
L7	40 nH, nom.	35-5111
L8	40 nH, nom.	35-5110
	RESISTORS	
R1	10 KΩ, 5%, ¼W	*10-0103
R2	10 KΩ, 5%, ¼W	10-0103
R3	2.2 KΩ, 5%, ¼W	10-0222
R4	10 KΩ, 5%, ¼W	10-0103
R5	1.5 KΩ, 5%, ¼W	10-0152
R6	15 Ω, 5%, ¼W	10-0150
R7	2.2 KΩ, 5%, ¼W	10-0222
R8	220 Ω, 5%, ¼W	10-0221
R9	22 Ω, 5%, ¼W	10-0220
R10	220 Ω, 5% ¼W	10-0221
R11	2.2 KΩ, 5%, ¼W	10-0222
R12	15 Ω, 5%, ¼W	10-0150
R13	100 Ω, 5%, ¼W	10-0101
R14	220 Ω, 5% ¼W	10-0221
R15	15 Ω, 5%, ¼W	10-0150
R16	150 Ω, 5%, ¼W	10-0151
R17	2.2 KΩ, 5%, ¼W	10-0222
R18		
R19	2.2 KΩ, 5%, ¼W	10-0222
R20	470 Ω, 5%, ¼W	10-0471
R21	15 Ω, 5%, ¼W	10-0150
R22	150 Ω, 5%, ¼W	10-0151
R23	15 Ω, 5%, ¼W	10-0150
R24	470 Ω, 5%, ¼W	10-0471
R25	220 Ω, 5%, ¼W	10-0221
R26	15 Ω, 5%, ¼W	10-0150
R27	150 Ω, 5%, ¼W	10-0151
R28	2.2 KΩ, 5%, ¼W	10-0222
R29	4.7 Ω, 5%, ¼W	10-1470
R30	2.2 KΩ, 5%,¼W	10-0222
R31	470 Ω, 5%, ¼W	10-0471
R32	15 Ω, 5%, ¼W	10-0150
R33	150 Ω, 5%, ¼W	10-0151
R34	15 Ω, 5%, ¼W	10-0150
R35	470 Ω, 5%, ¼W	10-0471
R36	4.7 Ω, 5%, ¼W	10-1470
R37	470 Ω, 5%, ¼W	10-0471

IM-1007 PARTS LIST (continued)

Schem. Desig.	Description	PTS P/N
	TRANSISTORS	
Q1	2SC 1260	40-1260
Q2	2SC 1260	40-1260
Q3	2SC 1260	40-1260
Q4	2SC 1260	40-1260
Q5	2N 5179	40-5179
	DIODES	
CR1	5082-3080	71-3080
CR2	5082-3080	71-3080
CR3	5082-3080	71-3080
CR4	5082-3080	71-3080
	INTEGRATED CIRCUITS	
M1	SRA 1H	65-5100

*NOTE: 10-xxxx carbon composition
11-xxxx carbon film

OA-1037 PARTS LIST

Schem. Desig.	Description	PTS/PN
	CAPACITORS	
C1	5pF, 5%, 500V, NPO	20-1500
C2	6.8pF, 5%, 500V, NPO	20-1680
C3	1.5pF, 5%, 500V, NPO	20-1150
C4	12pF, 5%, 500V, NPO	20-0120
C5	18pF, 5%, 500V, NPO	20-0180
C6	20pF, 5%, 500V, NPO	20-0200
C7	12pF, 5%, 500V, NPO	20-0120
C8	50nF, 80/20%, 50V, Z5V	23-0503
C9	50nF, 80/20%, 50V, Z5V	23-0503
C10	47pF, 5%, 500V, NPO	20-0470
C11	100pF, 5%, 500V, N750	21-0101
C12	50nF, 80/20%, 50V, Z5V	23-0503
C13	68pF, 5%, 500V, N750	21-0680
C14	50nF, 80/20%, 50V, Z5V	23-0503
C15	50nF, 80/20%, 50V, Z5V	23-0503
C16	47pF, 5%, 500V, NPO	20-0470
C17	10nF, 80-20%, 50V, Y5U	23-0103
C18	3.5-13pF, C. var.	26-5101
C19	50nF, 80/20%, 50V, Z5V	23-0503
C20	10nF, 80-20%, 50V, Y5U	22-0103
C21	10nF, 80-20%, 50V, Y5U	23-0103
C22	5pF, 5%, 500V, NPO	20-1500
C23	50nF, 80/20%, 50V, Z5V	23-0503
C24	6.8 μF, E1-Tant., 25V	30-5101
C25	18pF, 5%, 500V, NPO	20-0180
C26	50nF, 80/20%, 50V, Z5V	23-0503
C27	6.8 μF, E1-Tant., 25V	30-5101
C28	10nF, 80-20%, 50V, Y5U	23-0103
C29	68pF, 5%, 500V, N750	21-0680
C30	6.8 μF, E1-Tant., 25V	30-5101
C31	8.2pF, 5%, 500V, NPO	20-1820
C32	8.2pF, 5%, 500V, NPO	20-1820
C33	50nF, 80/20%, 50V, Z5V	23-0503
C34	50nF, 80/20%, 50V, Z5V	23-0503
C35	12pF, 5%, 500V, NPO	20-0120
C36	3.3pF, 5%, 500V, NPO	20-1330
C37	1.5nF, 10%, 500V, Y5F	22-0152
C38	560pF, 10%, 500V, Y5F	22-0561
C39	220pF, 10%, 500V, Y5F	22-0221
C40	10nF, 80-20%, 50V, Y5U	23-0103
C41	1nF, 10%, 500V, X5F, Y5F	22-0102
C42	1.5nF, 10%, 500V, X5F, Y5F	22-0152
C43	6.8 μF , E1-Tant., 25V	30-5101
C44	50nF, 80/20%, 50V, Z5V	23-0503

OA-1037 PARTS LIST (continued)

Schem. Desig.	Description	PTS/PN
	INDUCTORS	
L1	20nH, nom.	35-5143
L2	20nH, nom.	35-5143
L3	20nH, nom.	35-5143
L4	22 µH, 5%	36-5106
L5	22 µH, 5%	36-5106
L6	22 µH, 5%	36-5106
L7	22 µH, 5%	36-5106
L8	46nH, nom.	35-5135
L9	25nH, nom.	35-5147
L10	38nH, nom.	35-5141
	RESISTORS	
R1	680 Ω, 5%, ¼W	11-0681
R2	330 Ω, 5%, ¼W	11-0331
R3	10 Ω, 5%, ¼W	11-0100
R4	220 Ω, 5%, ¼W	11-0221
R5	6.8 Ω, 5%, ¼W	11-1680
R6	15 Ω, 5%, ¼W	11-0150
R7	680 Ω, 5%, ¼W	11-0681
R8	330 Ω, 5%, ¼W	11-0331
R9	6.8 Ω, 5%, ¼W	11-1680
R10	220 Ω, 5%, ¼W	11-0221
R11	15 Ω, 5%, ¼W	11-0150
R12	10 Ω, 5%, ¼W	11-0100
R13	680 Ω, 5%, ¼W	11-0681
R14	1 KΩ, 5%, ¼W	11-0102
R15	2.2 Ω, 5%, ¼W	11-1220
R16	15 Ω, 5%, ¼W	11-0150
R17	220 Ω, 5%, ¼W	11-0221
R18	1.91 Ω, 1%, High Stability	14-5115
R19	1 KΩ, 5%, ¼W	11-0102
R20	10KΩ, 16%, ½W	16-5101
R21	470 Ω, 5%, ¼W	11-0471
R22	330 Ω, 5%, ¼W	11-0331
R23	6.8 Ω, 5%, ¼W	11-1680
R24	6.8 Ω, 5%, ¼W	11-1680
R25	47 Ω, 5%, ¼W	11-0470
R26	4.7 Ω, 5%, ¼W	11-1470
R27	47 Ω, 5%, ¼W	11-0470
R28	330 Ω, 5%, ¼W	11-0331
R29	100 Ω, 5%, ¼W	11-0101
R30	1.5 K Ω, 5%, ¼W	11-0152
R31	100 K Ω, 5%, ¼W	11-0104
R32	100 K Ω, 5%, ¼W	11-0104

OA-1037 PARTS LIST (continued)

Schem. Desig.	Description	PTS/PN
	RESISTORS	
R33	2.2 KΩ, 5%, ¼W	11-0222
R34	10 KΩ, 5%, ¼W	11-0103
R35	220 Ω, 5%, ¼W	11-0221
R36	10 KΩ, 10%, ½W	16-5101
R37	3.3 KΩ, 5%, ¼W	11-0332
R38	100 Ω, 5%, ¼W	11-0101
R39	500 Ω, 10%, ½W	16-5102
R40	1.91 KΩ, 1%, ¼W	14-5115
R41	2.2 KΩ, 5%, ¼W	11-0222
R42	2.2 KΩ, 5%, ¼W	11-0222
R43	1.91 KΩ, 1%, ¼W	14-5115
R44	4.32 KΩ, 1%, ¼W	14-5113
R45	4.32 KΩ, 1%, ¼W	14-5113
	TRANSISTORS	
Q1	A400	40-A400
Q2	A400	40-A400
Q3	A401	40-A401
Q4	BFR95	42-BFR95
	DIODES	
CR1	5082-2810	71-2810
CR2	5082-2810	71-2810
CR3	5082-2810	71-2810
CR4	5082-2810	71-2810
	INTERGRATED CIRCUITS	
U1	LM324	64 0324

BLOCK DIAGRAM, PTS 250

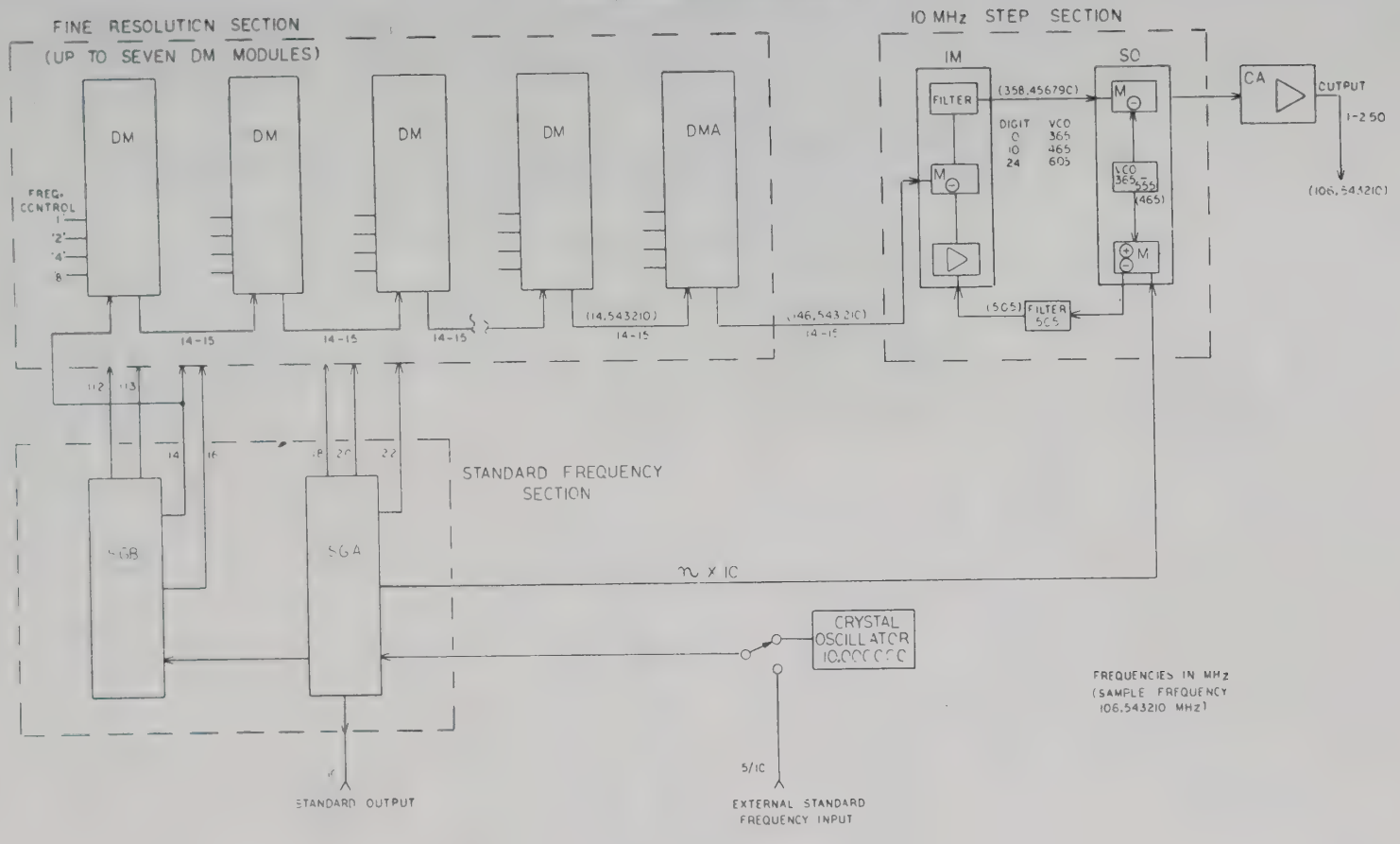


Figure 1

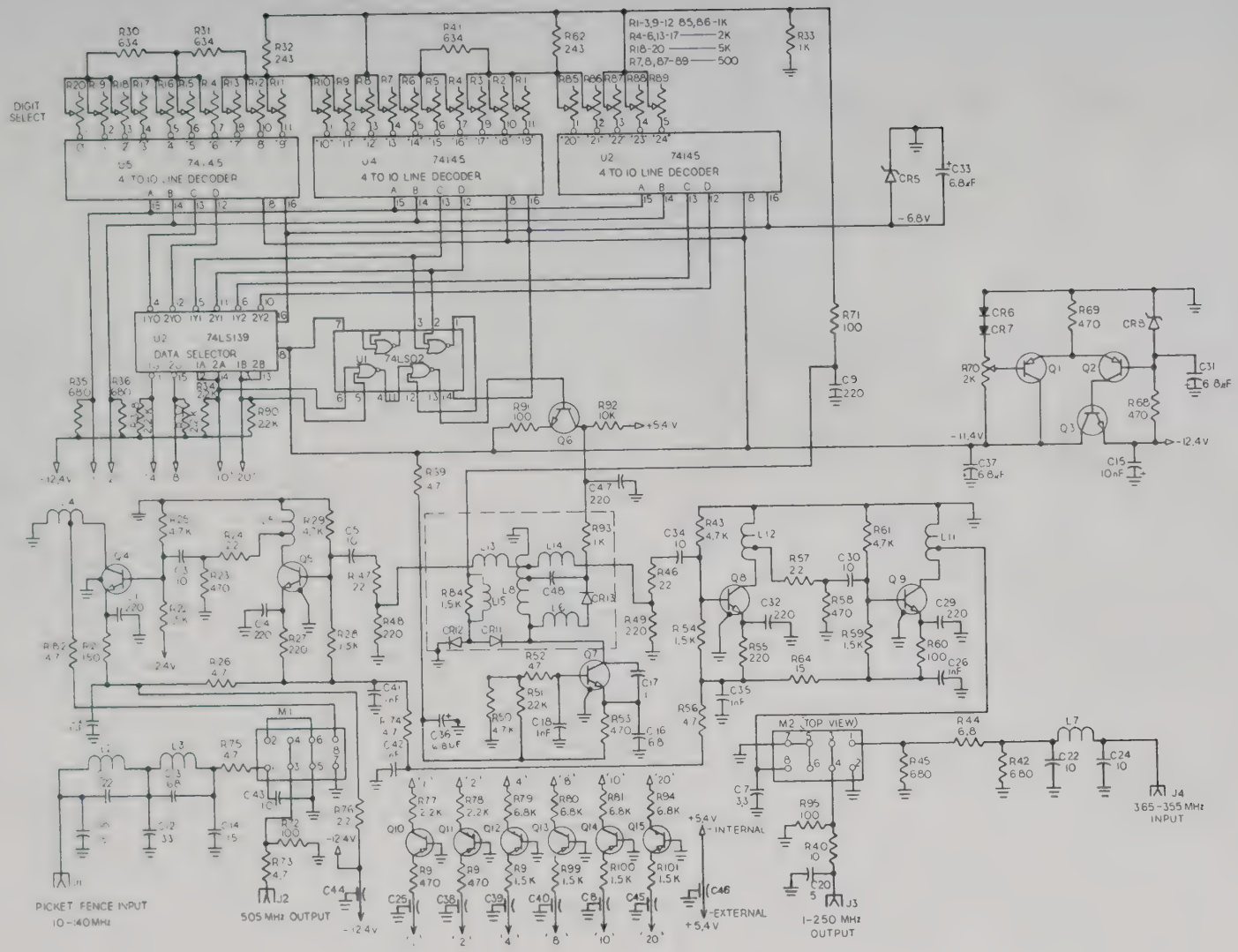

R1-3,9-12 85,86-1K
R4-6,13-17 2K
R18-20 5K
R7,8,87-89 500
DIGIT SELECT
U5 74145 4 TO 10 LINE DECODER
U4 74145 4 TO 10 LINE DECODER
U2 74145 4 TO 10 LINE DECODER
U2 74LS139 DATA SELECTOR
U1 74LS02
CR5
C33 6.8uF
-6.8V
R71 100
C9 220
CR6
CR7
CR8
R69 470
R70 2K
Q1
Q2
Q3
C31 6.8uF
R68 470
-11.4V
-12.4V
C37 6.8uF
C15 10nF
R91 100
R92 10K
+5.4V
Q6
R39 4.7
C47 220
R93 1K
R84 1.5K
L8
C48
CR13
CR12
CR11
R52 47
Q7
R51 22K
R50 4.7K
C18 1nF
R53 470
C17 1
C16 6.8
C36 6.8uF
C41 1nF
R74 4.7
C42 1nF
R46 22
R49 220
C34 10
R43 4.7K
L12
R57 22
C30 10
R61 4.7K
L11
Q8
Q9
C32 220
R58 470
R59 1.5K
R60 100
C29 220
C26 1nF
R54 1.5K
R55 220
R64 15
C35 1nF
R56 4.7
M2 (TOP VIEW)
R44 6.8
L7
R45 680
R42 680
C22 10
C24 10
J4 365-355 MHz INPUT
C7 3.3
R95 100
R40 10
C20 5
J3 1-250 MHz OUTPUT
M1
R75 4.7
C43 10
R76 2.2
R72 100
R73 4.7
J2 505 MHz OUTPUT
C44
J1 PICKET FENCE INPUT 10-140MHz
R77 2.2K
R78 2.2K
R79 6.8K
R80 6.8K
R81 6.8K
R94 6.8K
Q10
Q11
Q12
Q13
Q14
Q15
R97 470
R98 1.5K
R99 1.5K
R100 1.5K
R101 1.5K
C25
C38
C39
C40
C8
C45
+5.4V INTERNAL
C46
-EXTERNAL
+5.4V

Figure 2

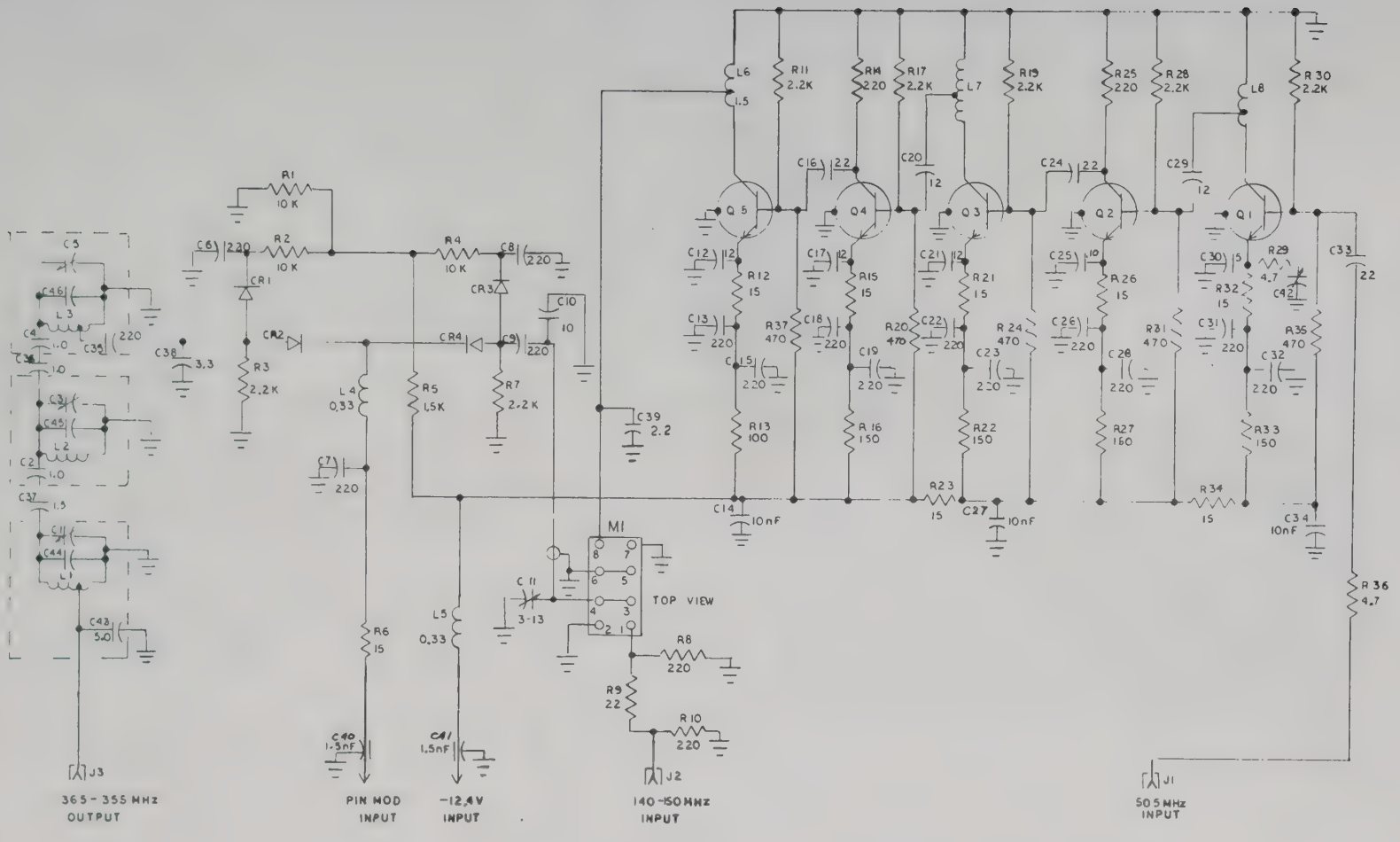

L6
L5
R11
2.2K
R14
220
R17
2.2K
L7
R19
2.2K
R25
220
R28
2.2K
L8
R30
2.2K
Q5
Q4
Q3
Q2
Q1
C16 22
C20 12
C24 22
C29 12
C33 22
R1
10K
R2
10K
R4
10K
C8 220
CR1
CR2
CR3
CR4
C10 10
C9 220
R3
2.2K
L4
0.33
R5
1.5K
R7
2.2K
C39
2.2
C7
220
C38 3.3
C5
C46
L3
C4 1.0
C39 220
C3 1.0
C45
L2
C2 1.0
C37 1.5
C41
C44
L1
C43 5.0
C12 12
R12 15
C13 220
C17 12
R15 15
R37 470
C18 220
C19 220
R16 150
C21 12
R21 15
R20 470
C22 220
C23 220
R22 150
C25 10
R26 15
R24 470
C26 220
C28 220
R27 160
C30 15
R32 15
R31 470
C31 220
C32 220
R33 150
R29 4.7
C42
R35 470
C15 220
R13 100
C14 10nF
R23 15
C27 10nF
R34 15
C34 10nF
R36 4.7
M1
TOP VIEW
C11 3-13
R8 220
R9 22
R10 220
R6 15
C40 1.5nF
L5 0.33
C41 1.5nF
J3
365 - 355 MHz
OUTPUT
PIN MOD
INPUT
-12.4V
INPUT
J2
140 -150 MHz
INPUT
J1
505 MHz
INPUT

Figure 3

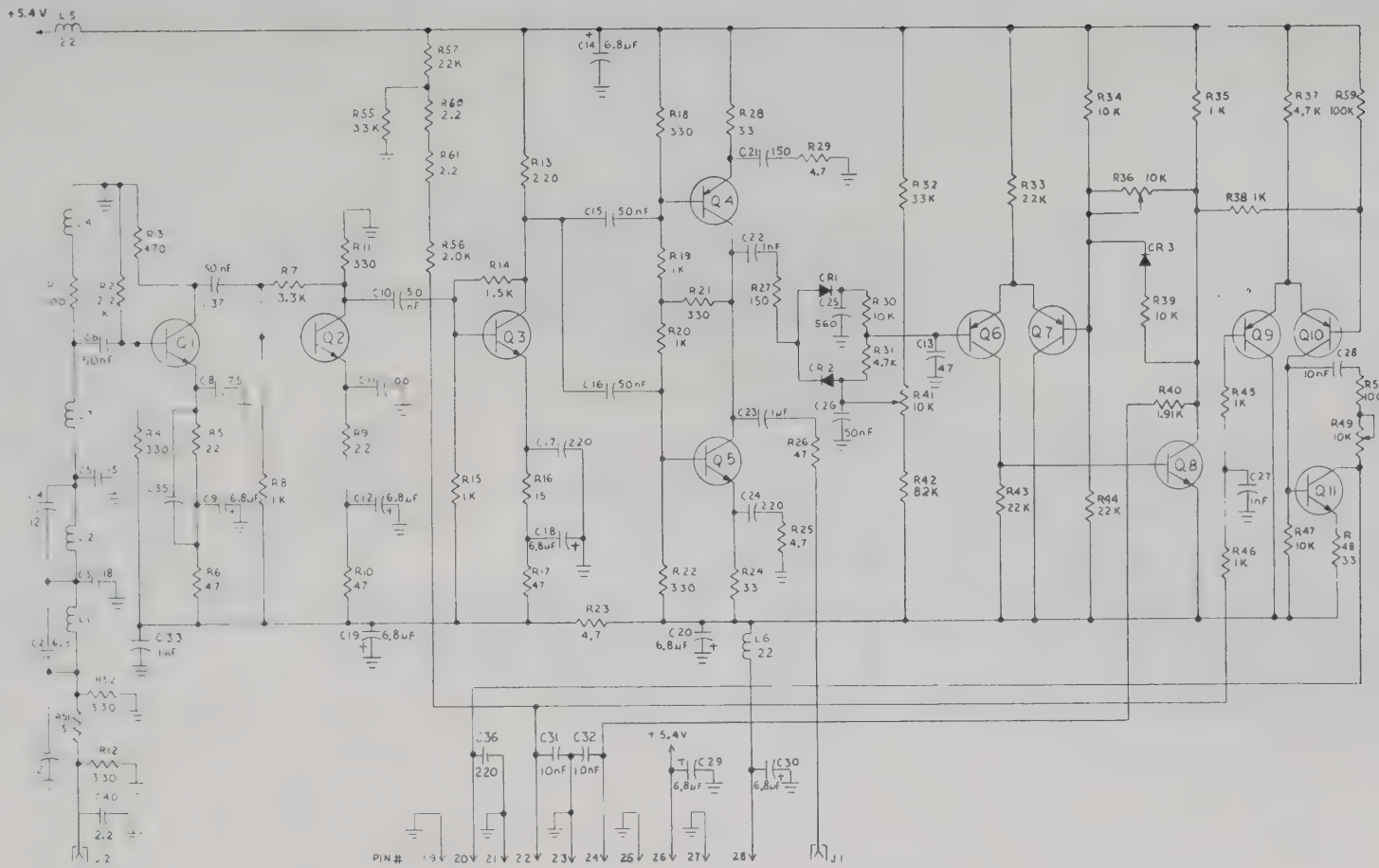

+5.4V
L5
22
R57 22K
R55 33K
R60 2.2
R61 2.2
R56 2.0K
C14 6.8µF
R13 220
R18 330
R28 33
C21 150
R29 4.7
Q4
C15 50nF
C16 50nF
R19 1K
R21 330
R20 1K
C22 1nF
CR1
C25 560
R27 150
R30 10K
R31 4.7K
CR2
C26 50nF
C13 47
R41 10K
R42 82K
R32 33K
R33 22K
R34 10K
R35 1K
R36 10K
R38 1K
CR3
R39 10K
R37 4.7K
R59 100K
Q6
Q7
Q9
Q10
C28 10nF
R50 100
R49 10K
R40 1.91K
R45 1K
R46 1K
C27 1nF
R47 10K
R48 33
Q8
Q11
R43 22K
R44 22K
C23 1µF
R26 47
R25 4.7
C24 220
Q5
R22 330
R24 33
R23 4.7
C20 6.8µF
L6 22
R3 470
R11 330
R56 2.0K
R14 1.5K
C10 50 nF
R7 3.3K
50 nF
Q1
Q2
Q3
C8 75
C11 00
R9 22
R4 330
R5 22
R8 1K
C9 6.8µF
C12 (6.8µF
R15 1K
R16 15
C17 220
C18 6.8µF
R17 47
R10 47
C19 6.8µF
C33 1nF
R6 4.7
C36 220
C31 C32
10nF 10nF
+5.4V
C29 6.8µF
C30 6.8µF
PIN #
19 20 21 22 23 24 25 26 27 28
J1
PIN MOD. SET LEVEL METER +5.4V -12.4V
1-200 MHz INPUT
1-200 MHz OUTPUT

Figure 4

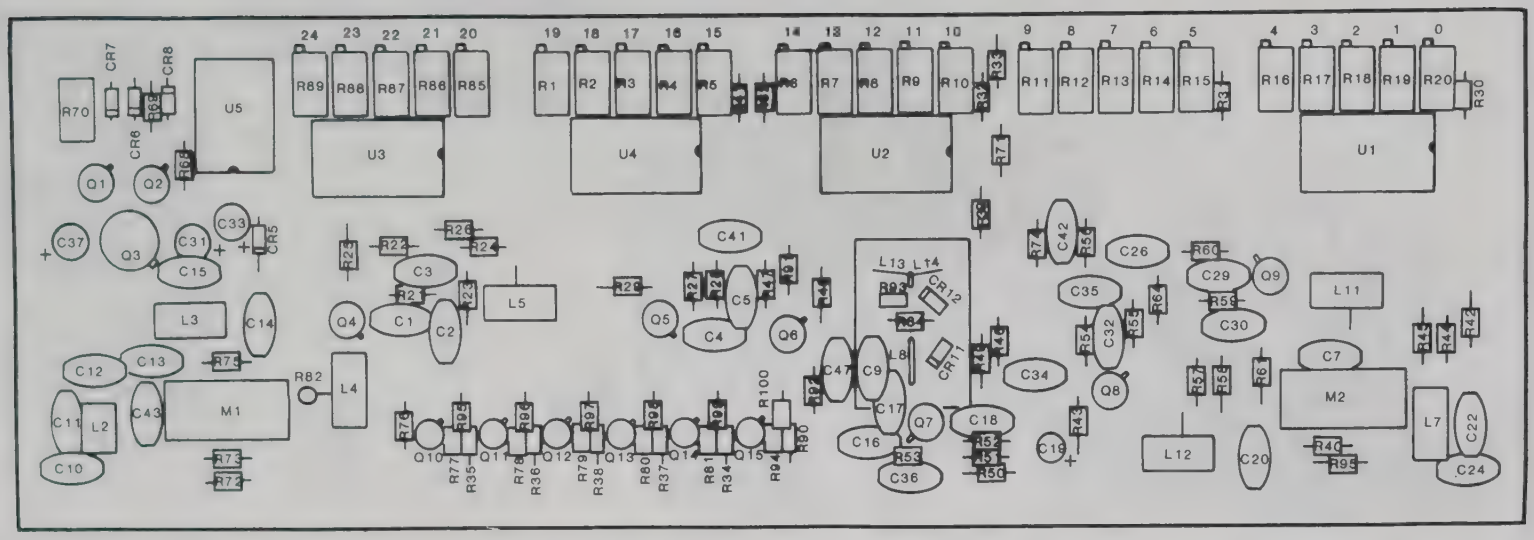

24 23 22 21 20
19 18 17 16 15
14 13 12 11 10
9 8 7 6 5
4 3 2 1 0
U1
U2
U3
U4
U5
M1
M2
L1
L2
L3
L4
L5
L7
L11
L12
L13 L14
CR1
CR2
CR5
CR6
CR7
CR8
Q1
Q2
Q3
Q4
Q5
Q6
Q7
Q8
Q9
Q10
Q11
Q12
Q13
Q14
Q15

Figure 5

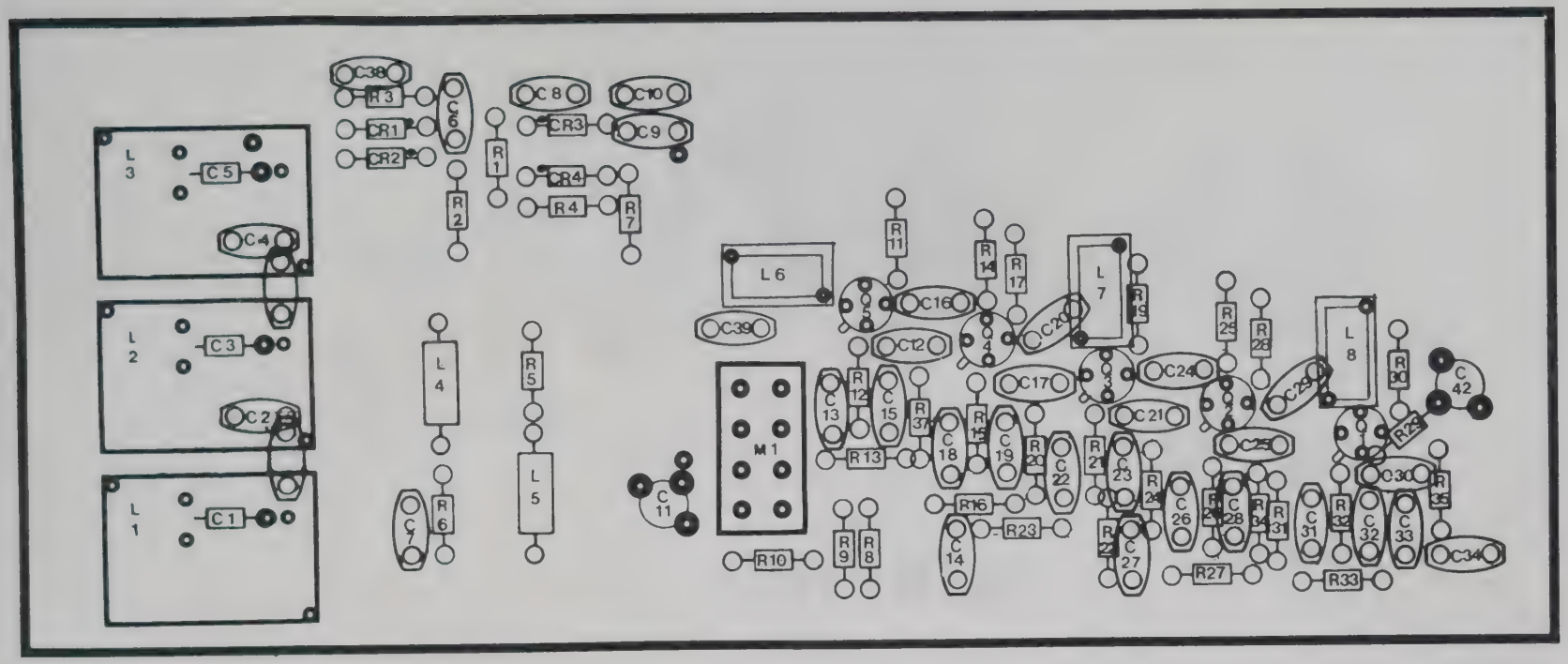

C38
R3
CR1
CR2
C6
R1
R2
C8
C10
CR3
C9
CR4
R4
R7
L3
C5
C4
L2
C3
C2
L1
C1
L4
L5
C7
R6
R5
C11
L6
C39
M1
R10
R9
R8
R11
C16
C12
R14
R17
C28
L7
R18
C17
C24
C21
C25
R25
R26
C29
L8
R30
C42
R29
C30
R35
C34
C13
R12
C15
R37
R13
C18
R15
C19
R20
C22
R16
R23
C14
R21
C23
C27
R22
R24
C26
R28
R34
R31
C31
R32
C32
C33
R27
R33

Figure 6

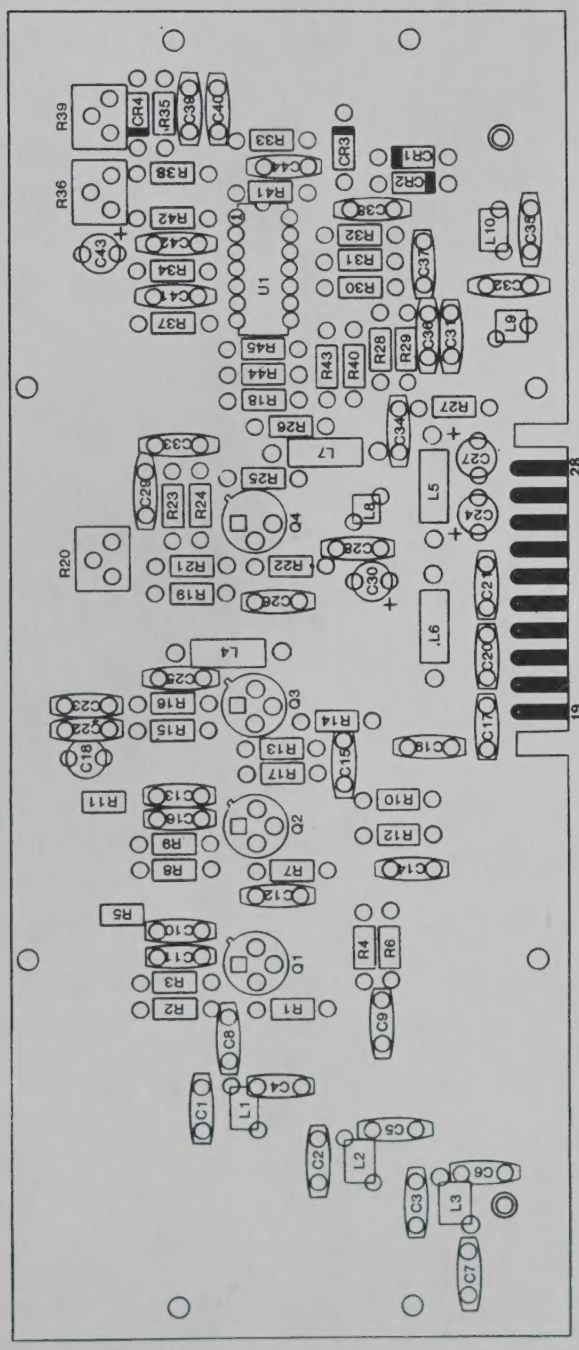

R39
CR4
R35
C39
C40
R33
C44
R36
R38
R41
C43
R42
C42
R34
C41
R37
U1
CR3
CR1
CR2
C38
R32
R31
R30
C37
L10
C35
C32
L9
R45
R44
R43
R40
R28
R29
C36
C31
R18
R26
C34
R27
L7
C33
C25
R25
R23
R24
Q4
L8
L5
Q7
Q4
28
R20
C28
R22
R21
R19
C30
C24
C21
L6
L4
C20
C23
C22
R16
R15
Q3
C17
C18
R14
19
R13
R17
C15
C16
R10
R11
C13
R12
R9
R8
Q2
C14
R7
C12
R5
C10
C11
R4
R6
R3
Q1
R2
R1
C9
C8
C1
C4
L1
C5
C2
L2
C6
C3
L3
C7

Figure 7